



**TIFR Centre for Interdisciplinary Sciences,
Narsingi, Hyderabad 500075**

Seminar

**Device-independent and secured quantum memory using
quantum walks**

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Preparing, storing, manipulating, transmitting and measuring quantum states are the essential elements of quantum information processing and communication. In this seminar we will present a new device independent and secured protocol for quantum memory. Coherent quantum evolution and dynamic localization are the fundamental phenomenon for this new protocol.

Coherent quantum evolution in the form of quantum walks results in nontrivial quantum correlations between the particle (qubit) and the position space. Therefore, first look at dynamical process appears to be an unlikely candidate for a quantum memory. In this talk we present a careful analysis of the dynamics and show that the stored information of a qubit can be perfectly recovered at specific times t which are periodic and a function of coin parameter θ , used for evolving the walk. Due to the spatial spread of the qubit in position space, the information stored will also acquire an inherent level of security from an eavesdropper.

Though in principle this model describes a fully functioning quantum memory, the dependency of the recovery time (t), on coin parameter (θ) and a linear increase in size of the position space required to store the information of the qubit poses an unwelcome and limiting restriction. By amending the protocol we show that one can recover the information at any time and independent of θ . Our protocol can be adopted to any quantum system for which experimental control over quantum walk dynamics can be achieved and to systems whose dynamics are described by Dirac equations (Dirac materials).

Thursday, Jan 23rd 2014

11:30 AM (Tea/Coffee at 11:15 AM)

Seminar Hall, TCIS